Office of Energy Efficiency and Renewable Energy

Lower-Cost Carbon Fiber

Background

Carbon fiber composites (CFCs), which can reduce body and chassis weight by more than 60%, are the lightest materials for making automotive structures. However, the price of CFCs must be reduced for large-scale use by the automotive industry. Raw materials for CFCs account for 45-60% of production costs, and capital equipment represents 25-40%.

The U.S. Department of Energy is working with domestic automotive manufacturers and carbon fiber suppliers to reduce the cost of CFCs for high-volume applications. This program addresses methods to reduce material cost, initial fiber preconditioning, and high-temperature processing. Oak Ridge National Laboratory is examining the use of microwave energy to manufacture low-cost, high-quality carbon fibers.

Accomplishments

- This microwave technology produces fibers with densities, electrical resistivities, fiber diameters, and tow areas comparable to those made by conventional processes.
- Microwave processing times of 5-8 minutes compare with conventional processing times of 40-90 minutes.
- This technology can replace 70-90% of the conventional processing line, which accounts for 25-40% of processing costs. This process alone could yield a 20% reduction in carbon fiber price.

Benefits

- Allow development of ultralightweight, affordable automotive structures that will reduce emissions and fuel consumption while preserving safety and affordability.
- Establish U.S. industry leadership and secure future jobs by early use of the next generation of advanced materials.

Future Activities

- Complete design, durability, joining, and safety research to explore the full potential of this material.
- Identify low-cost precursors as alternatives to conventional materials. Potential candidates include recycled materials, organic materials, low-cost polymers, and coal-derived products. Use of these materials could reduce the cost of precursors to $0.20-$1.20 per pound, making carbon fibers affordable for use by the domestic automotive industry.

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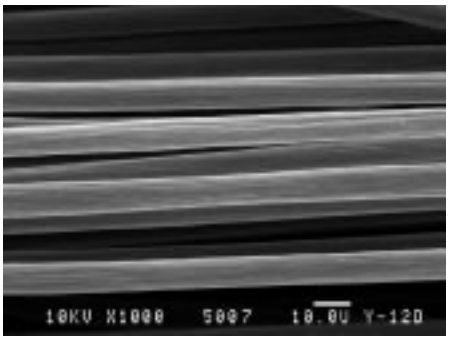
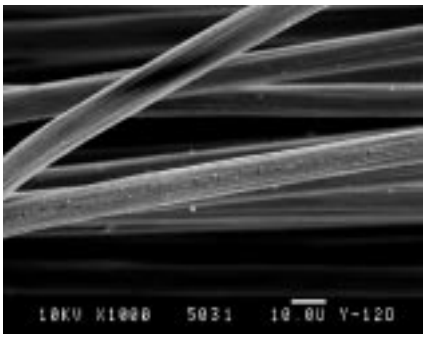


Carbon Fibers Produced by Conventional Methods



Carbon Fibers Produced by Microwave Methods